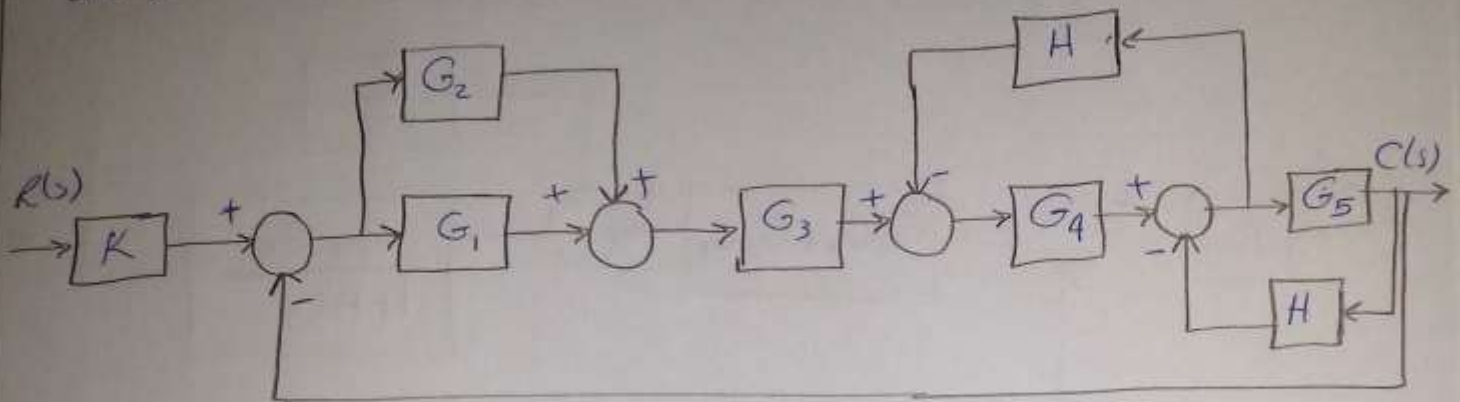
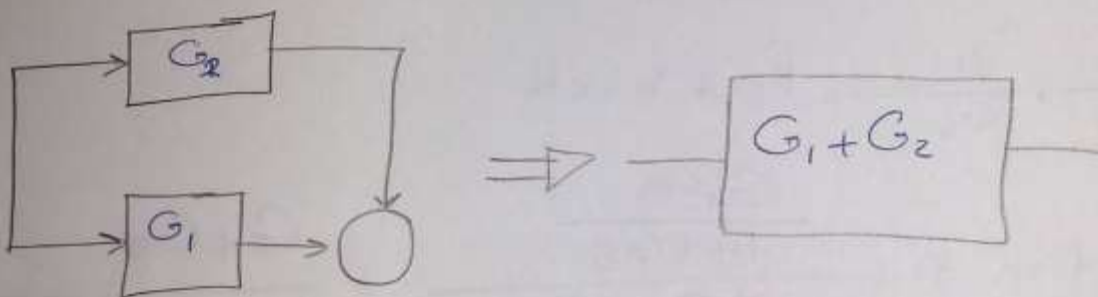


Sheet 4

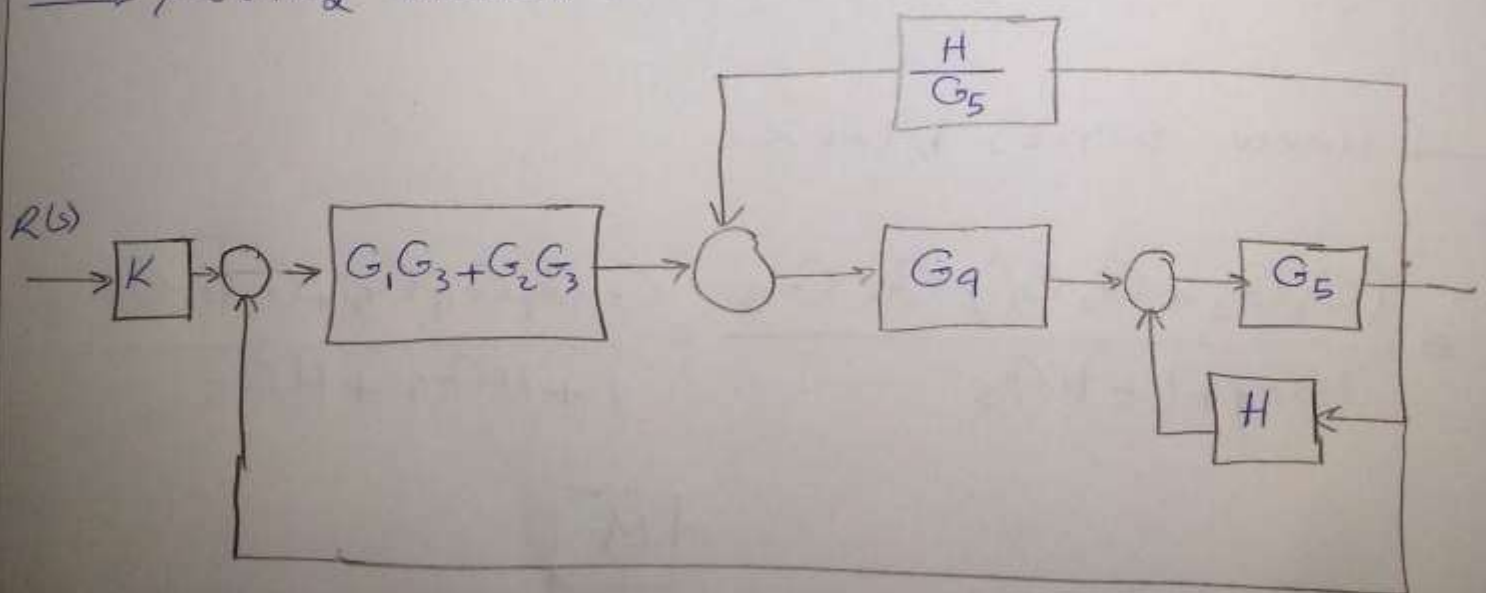
1] Find the transfer function $\frac{C(s)}{R(s)}$ by block diagram reduction for the system given:-



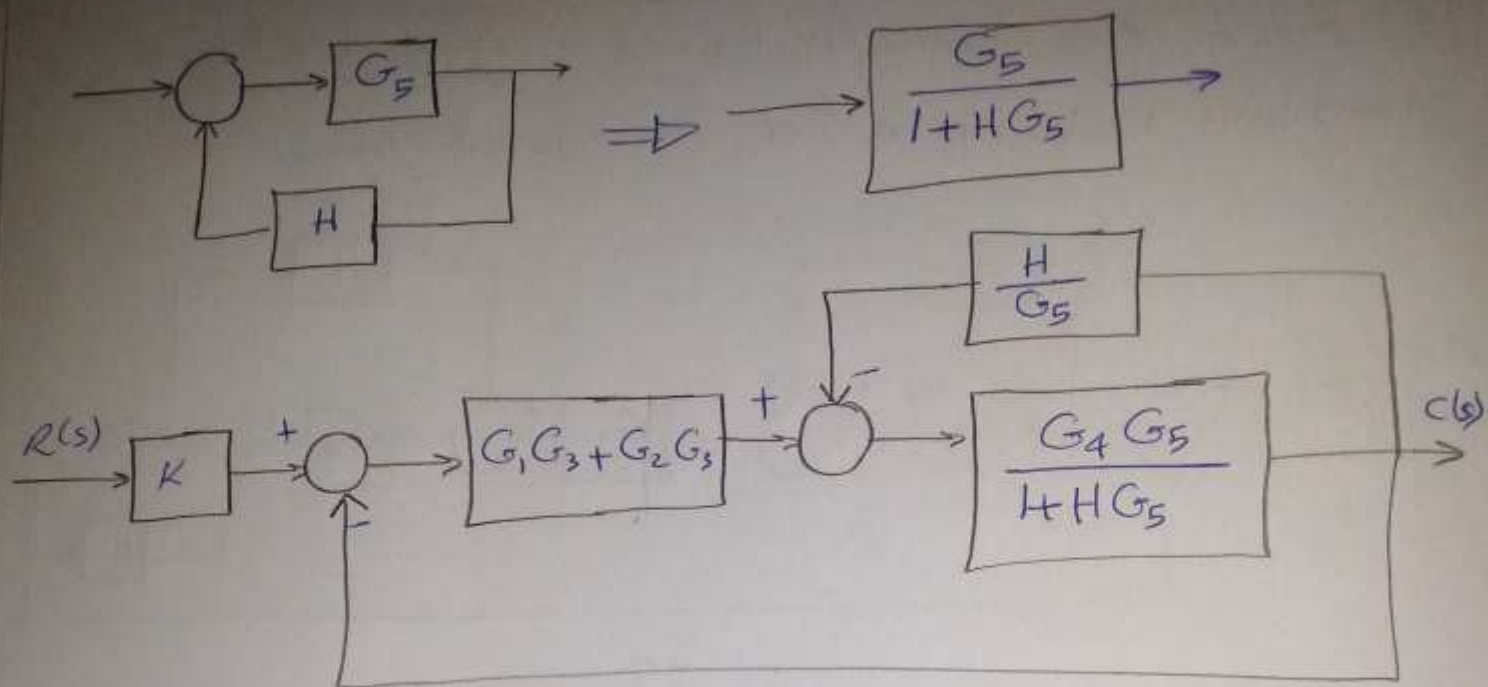
Sol



→ moving branch point after G_5



1] Sheet 4



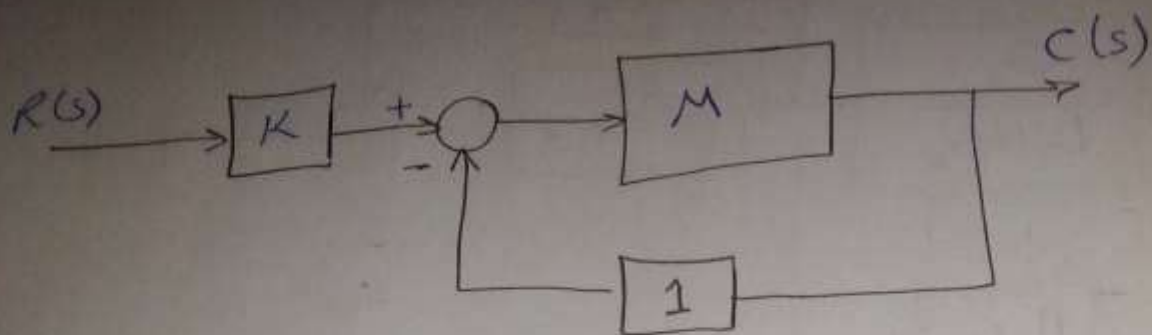
$$\frac{G_4 G_5}{1 + H G_5} \text{ and } \frac{H}{G_5} \rightarrow \text{Feed back}$$

$$\text{it's reduction} = \frac{\frac{G_4 G_5}{1 + H G_5}}{1 + \frac{H G_4}{1 + H G_5}} = \frac{G_4 G_5}{H G_4 + 1 + H G_5}$$

→ a new series block

$$\equiv \frac{(G_1 G_3 + G_2 G_3) G_4 G_5}{H G_4 + 1 + H G_5} = \frac{G_1 G_3 G_4 G_5 + G_2 G_3 G_4 G_5}{1 + H G_4 + H G_5}$$

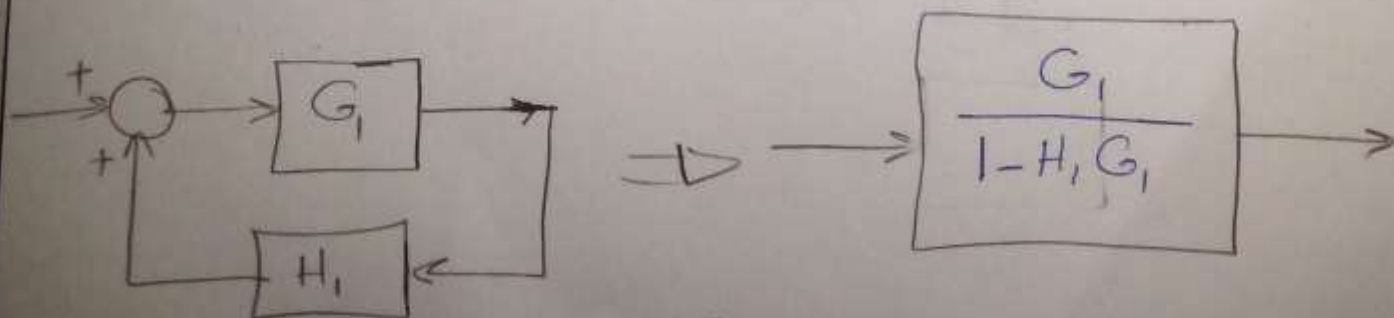
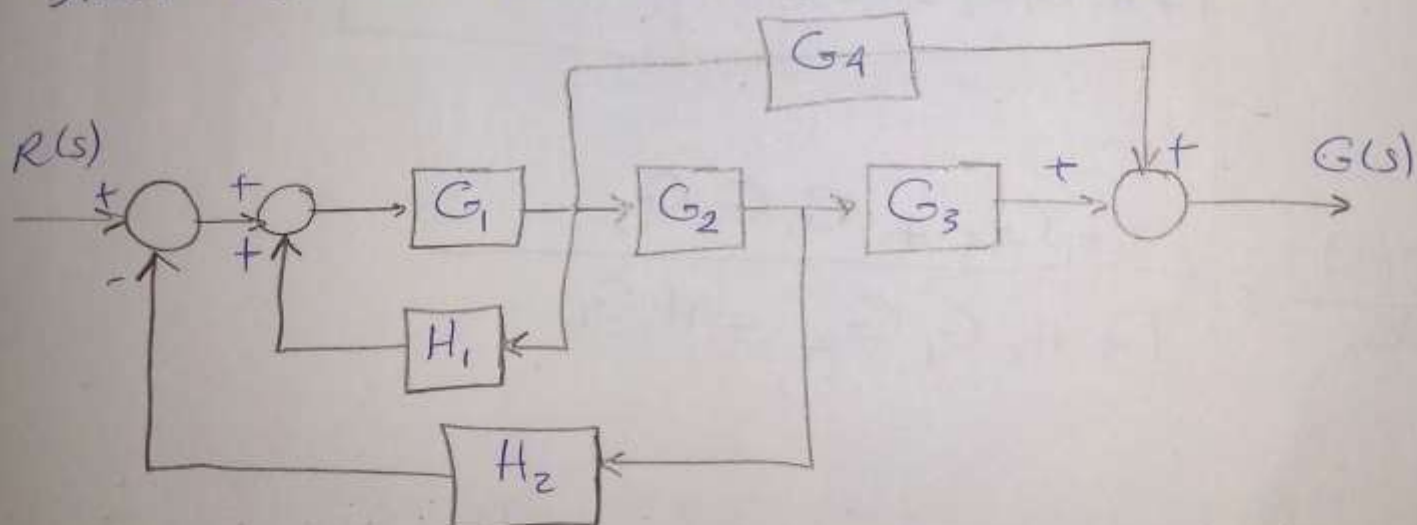
$$= \boxed{M}$$



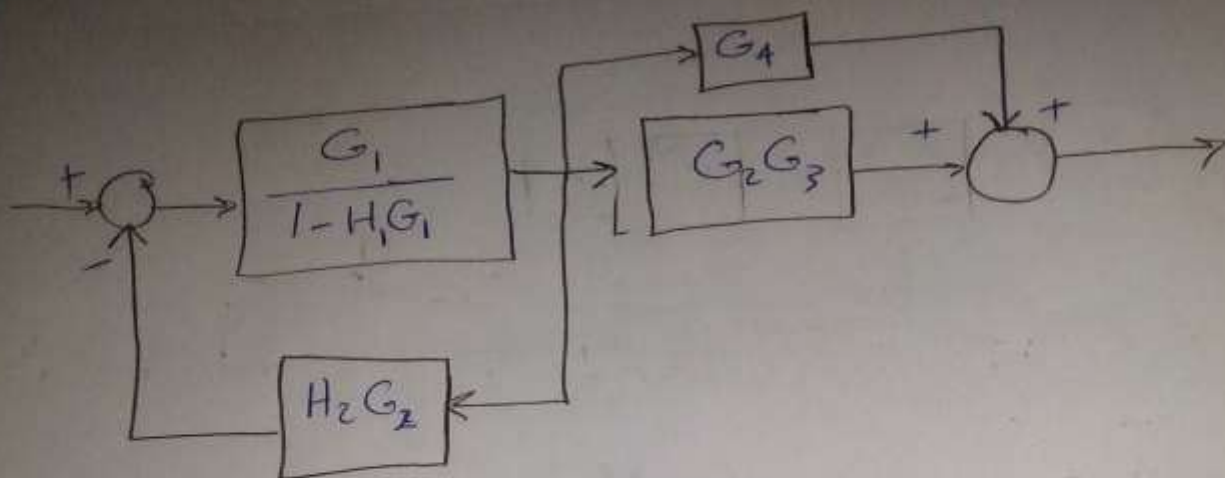
Feed back reduction: $\frac{M}{1+M}$

$$\frac{C(s)}{R(s)} = \frac{KM}{1+M}$$

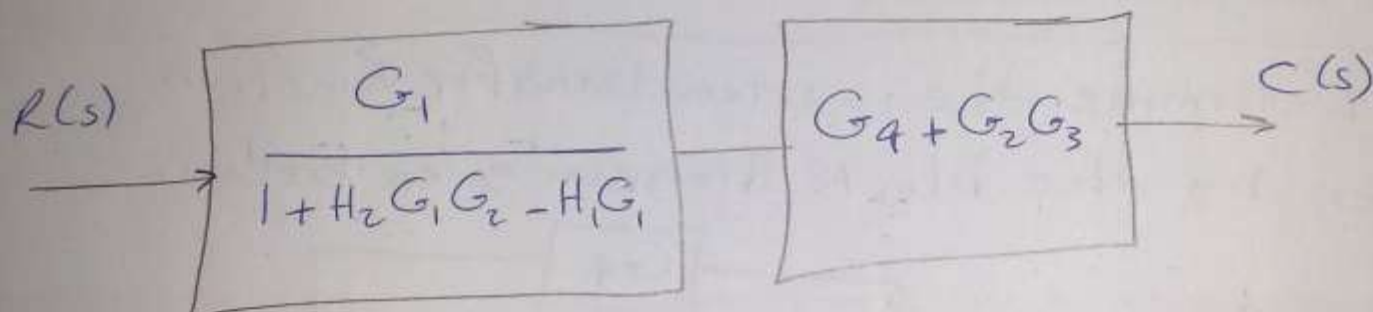
[2] Determine the system transfer function given by the block diagram given below.



[3] sheet 4

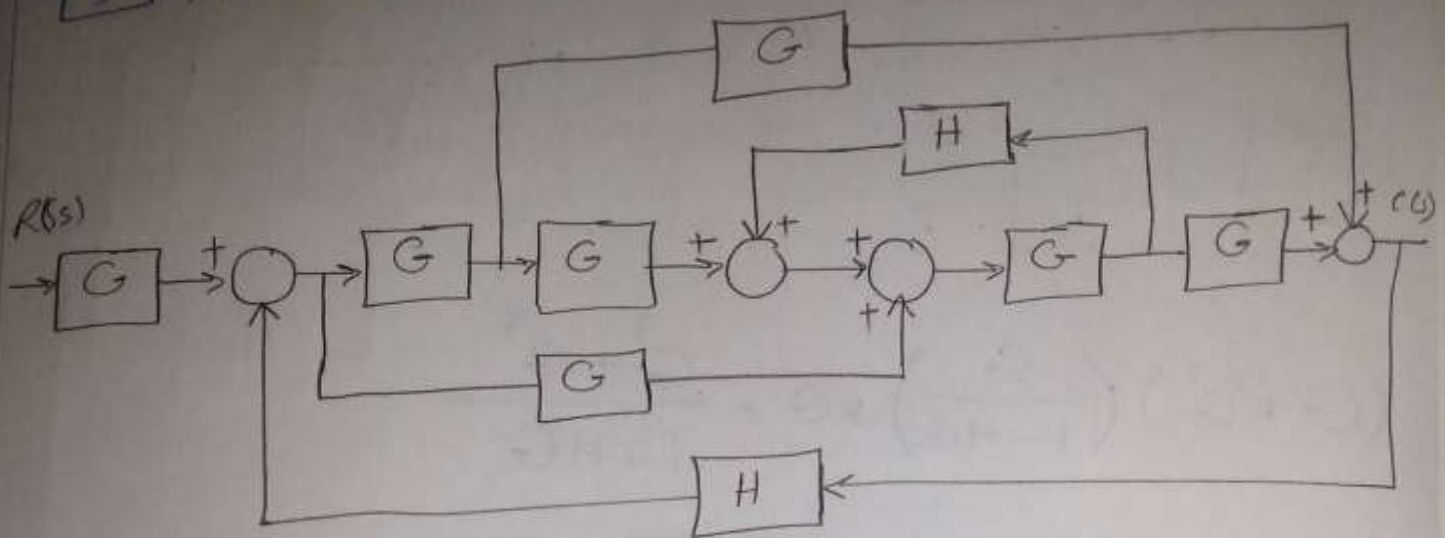


First Feed
Feedback $\rightarrow \frac{\frac{G_1}{1-H_1G_1}}{1 + \frac{H_2G_2G_1}{1-H_1G_1}} = \frac{G_1}{H_2G_1G_2 + 1 - H_1G_1}$

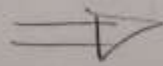
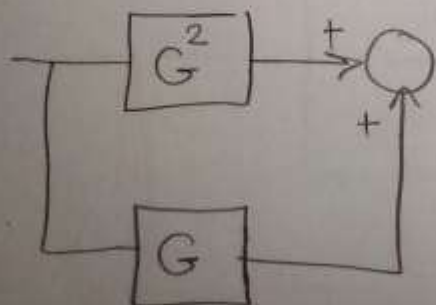
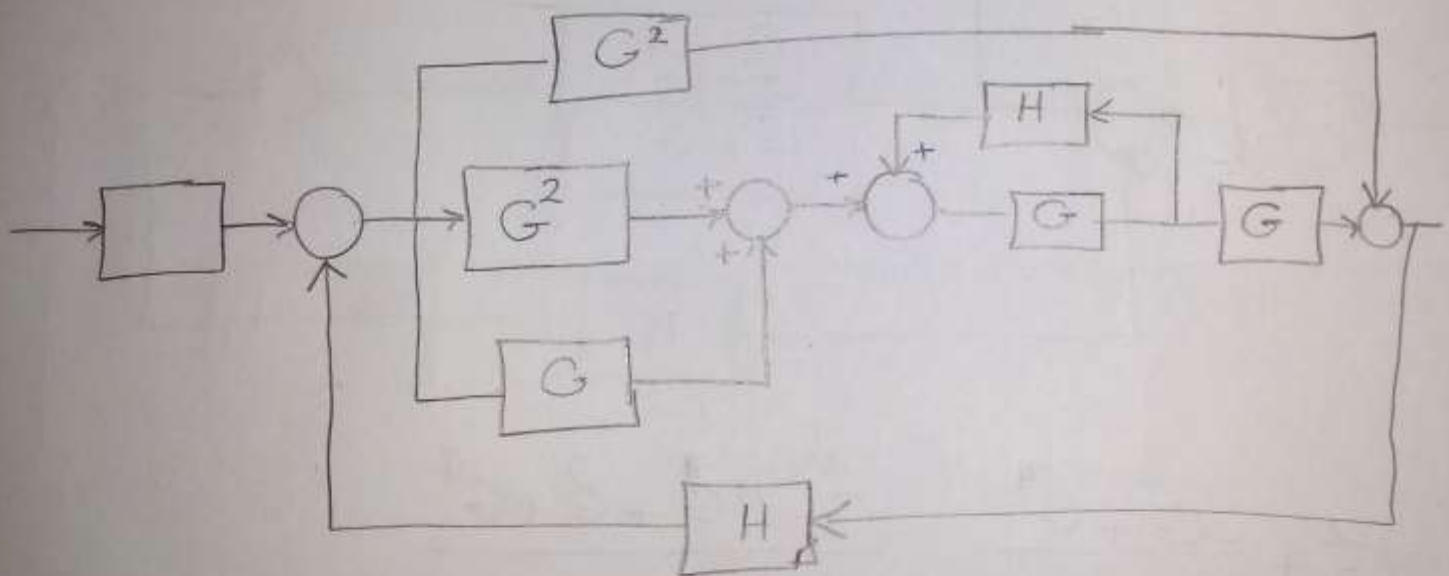


$$\frac{C(s)}{R(s)} = \frac{G_1G_4 + G_1G_2G_3}{1 + H_2G_1G_2 - H_1G_1}$$

3 Find transfer Function $C(s)/R(s)$

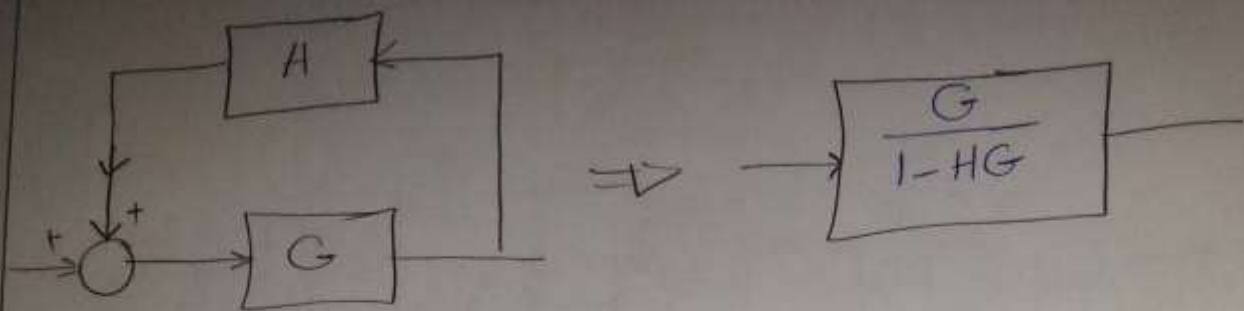


→ لتقوم بتبديل (2 summing point)

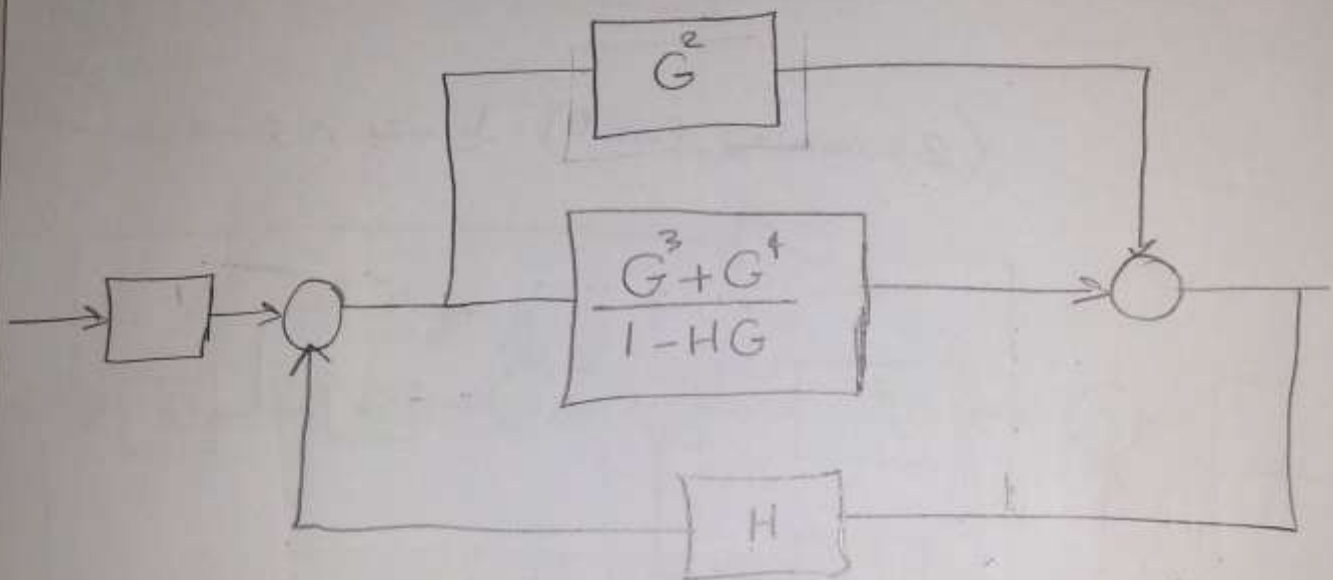


$$G + G^2$$

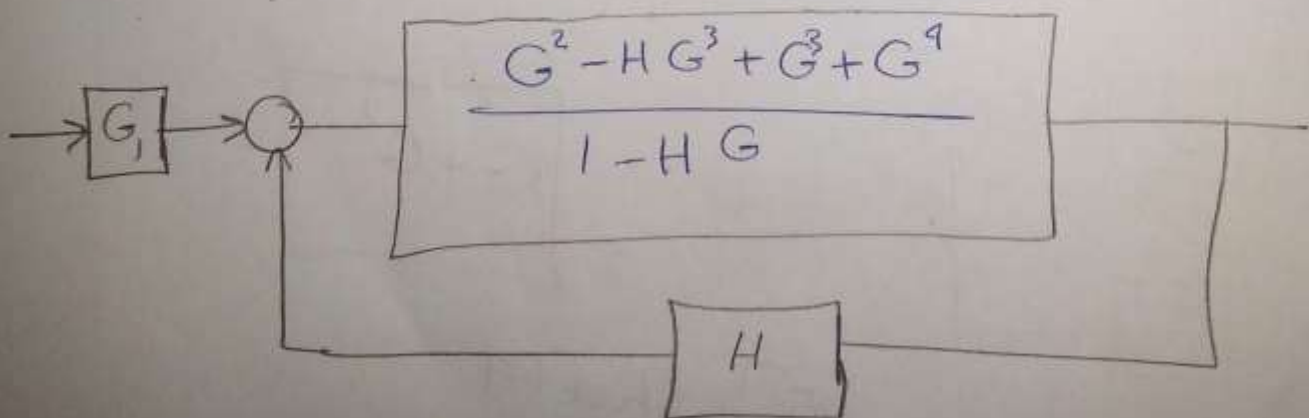
5 sheet 4



$$(G + G^2) \left(\frac{G}{1 - HG} \right) * G = \frac{G^3 + G^4}{1 - HG}$$



$$G^2 + \frac{G^3 + G^4}{1 - HG} = \frac{G^2 - HG^3 + G^3 + G^4}{1 - HG}$$



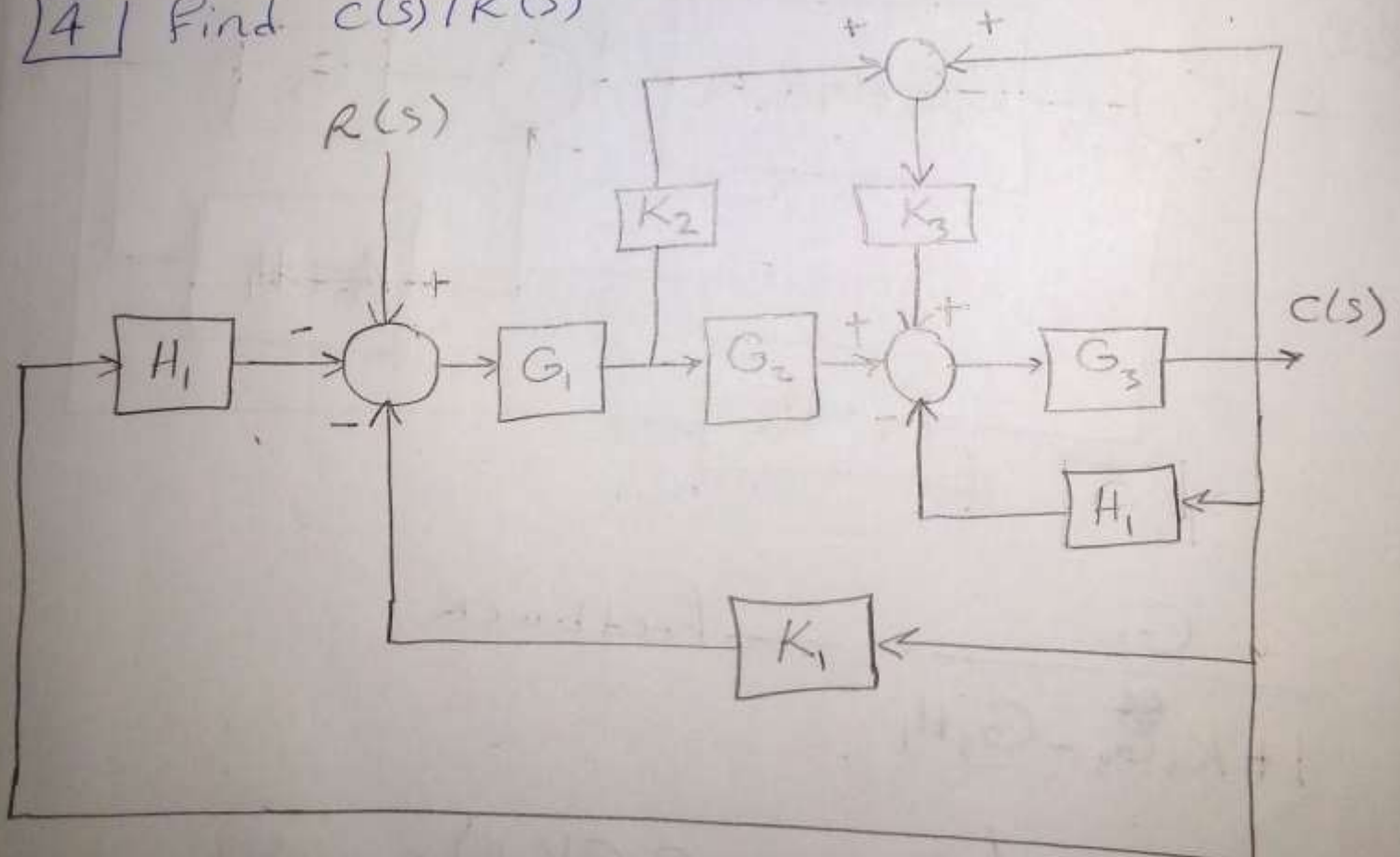
$$\text{Feed back reduction} = \frac{G^2 - HG^3 + G^3 + G^4}{1 - HG}$$

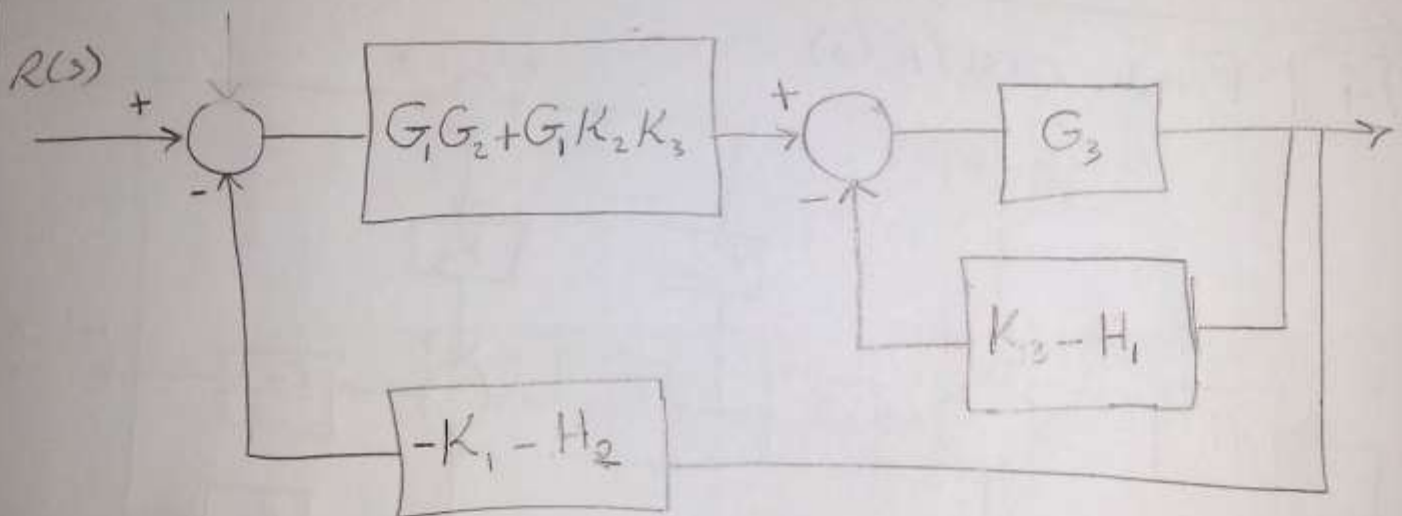
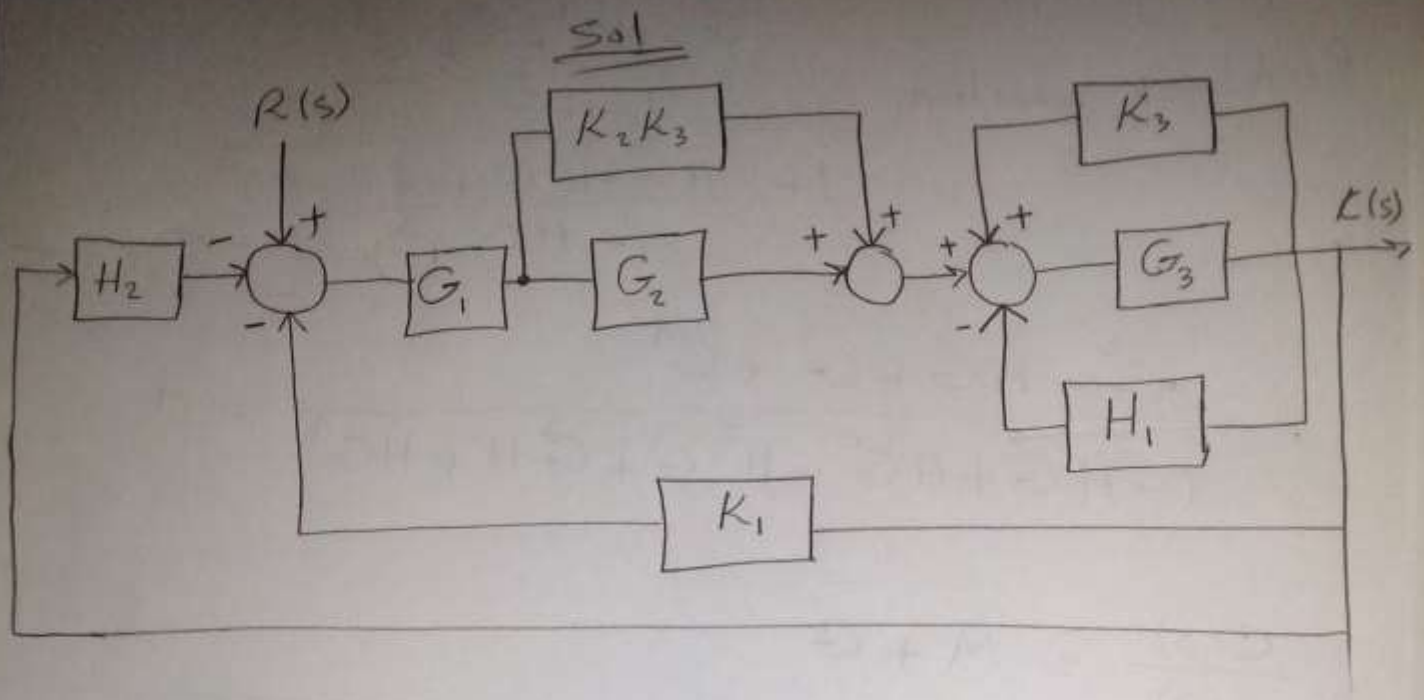
$$1 + \frac{HG^2 - H^2G^3 + G^3H + HG^4}{1 - HG}$$

$$= \frac{G^2 - HG^3 + G^3 + G^4}{1 - HG + HG^2 - H^2G^3 + G^3H + HG^4} = M$$

$$\frac{C(s)}{R(s)} = M + G$$

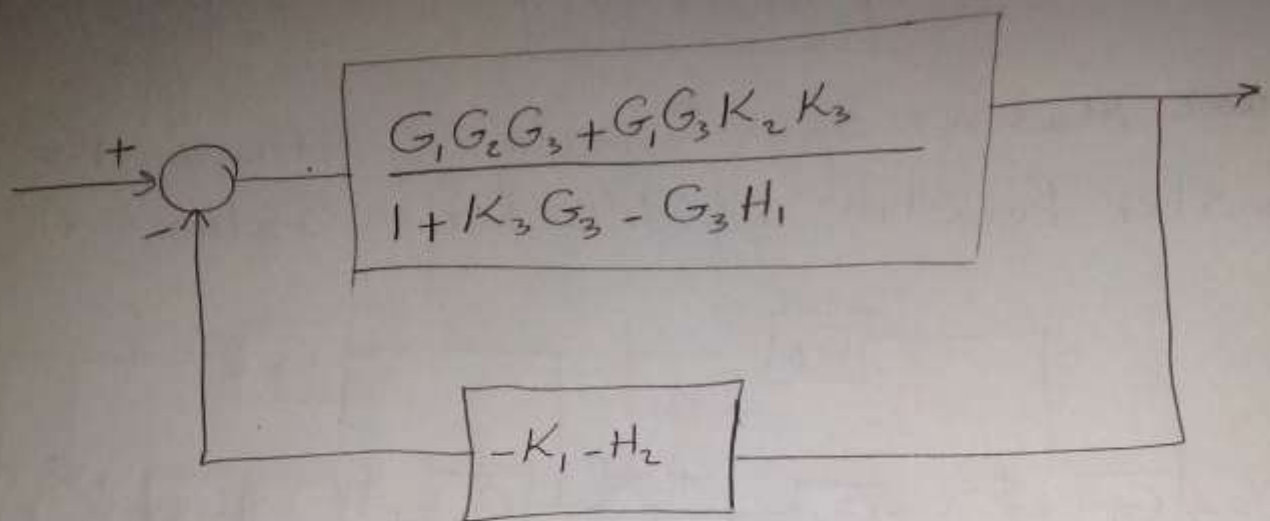
[4] Find $C(s)/R(s)$





$$\frac{G_3}{1 + K_3 G_3 - G_3 H_1} \rightarrow \text{feedback}$$

بالفرز: $(G_1 G_2 + G_1 K_2 K_3) \times$



$$\frac{C(s)}{R(s)} = \frac{\frac{G_1 G_2 G_3 + G_1 G_3 K_2 K_3}{1 + K_3 G_3 - G_3 H_1}}{1 - \frac{(K_1 + H_2)(G_1 G_2 G_3 + G_1 G_3 K_2 K_3)}{1 + K_3 G_3 - G_3 H_1}}$$

$$= \frac{G_1 G_2 G_3 + G_1 G_3 K_2 K_3}{1 + K_3 G_3 - G_3 H_1 - (K_1 + H_2)(G_1 G_2 G_3 + G_1 G_3 K_2 K_3)}$$